

Remarks

The Applicants have amended Claim 1 to place it into better form for allowance. Claim 1 has also been amended to recite that the pore structure has essentially one dimensional pores. Support may be found in the Applicants' Specification at page 9, lines 9 - 12. No new matter has been added.

The Applicants have added a new Claim 13 that is similar to Claim 1 except that it recites that the maximum pore aperture is between 0.7 and 0.9 nanometers. Support may be found in the Applicants' Specification at page 8, lines 4 and 21. Entry into the Official File and examination on the merits is respectfully requested.

The Applicants acknowledge the rejection of Claims 1 – 9, 11 and 12 under 35 U.S.C. §103 as being unpatentable over Davis, Zones and WO '486. The Applicants respectfully submit that all of the solicited claims are patentable over all three publications for the reasons set forth in detail below.

The Applicants note with appreciation the Examiner's frank acknowledgment that none of Davis, Zones and WO '486 disclose the specifically claimed aromatic compounds and the specifically claimed crystal size. Thus, it would be necessary for one of ordinary skill in the art to make modifications to two aspects of the claims to maintain the obviousness rejection. In other words, one of ordinary skill in the art would need to make modifications with respect to the specifically claimed aromatic compounds and, then, would additionally need to make modifications to the specifically claimed crystal size. None of the three references teaches or suggest such modifications.

The Applicants further acknowledge with appreciation the Examiner's helpful and detailed comments concerning the fact that the pore characteristics and crystal sizes are separate physical characteristics, as well as the commentary that the shape selectivity is independent of the crystal size. As a consequence, the Official Action maintains that one of ordinary skill in the art would utilize any crystal size with an expectation of effective process resulting.

The Applicants respectfully submit that the claimed methodology actually moves in a direction not only not taught or suggested by the three references, but in a direction that is away from what one of ordinary skill in the art would likely glean, having referred to those references. In particular, the Applicants' aromatic compounds are of a type that are larger aromatic compounds than those typically contemplated by Davis, Zones and WO '486. It intuitively follows that one of ordinary skill in the art would move towards zeolites having larger, more open pore characteristics so that such aromatic compounds can be appropriately separated from one another. Also, the teachings of the three references would tend to lead one of ordinary skill in the art to crystal sizes that are larger inasmuch as larger crystals do not tend to pack as tightly together, thereby leaving larger spaces available for appropriate compound transport through the catalyst.

However, the Applicants found that utilizing systems that are more open actually causes the problem of shortened catalyst life by virtue of clogging. More specifically, the Applicants found that there are essentially two types of pore structures, one having essentially one dimensional pores and another with three dimensional pores. A one dimensional pore system means that major channels do not intersect other major channels. In contrast, three dimensional pore systems means that major channels intersect each other.

Thus, if one of ordinary skill in the art examines larger aromatic compounds, such as those set forth in Claim 1, one would intuitively move towards the three dimensional pore system because it has large apertures and has large spaces formed by intersecting channels, thereby facilitating passage of the desired molecules. To their surprise, the Applicants found that there is a serious drawback in such three dimensional pore systems because undesired molecules are formed in the intersections of the channels of the large spaces and those undesired molecules remain in the large spaces and clog the pores, thereby depressing the activity of the catalysts.

The Applicants discovered that utilizing the one dimensional pore structure is better for the larger aromatic compounds, which is different from what one of ordinary skill in the art would likely expect. Claim 1 has been amended to more affirmatively claim this important aspect of the invention. Also, the Applicants invite the Examiner's attention to the Declaration of Mr. Yoshikawa that was previously submitted. He discussed the one dimensional pore system wherein the major channels did not intersect others having larger apertures which he found to be unfavorable, versus the three dimensional pore system wherein the major channels do intersect. Thus, the Applicants respectfully submit that all of Davis, Zones and WO '486 fail to provide teachings or suggestions that would lead one of ordinary skill in the art to make modifications that would lead one of ordinary skill in the art to the invention as recited in the solicited claims.

Further, the Official Action fails to consider another important aspect of the invention with respect to intracrystalline diffusion versus intercrystalline diffusion. The Applicants enclose pages 98 and 99 of "An Introduction to Zeolite Molecular Sieves", A. Dyer (1988), which includes a discussion of the potential presence of both of these factors and explanations as to what they are.

Crystal sizes can impact the relative diffusions of the catalysts. Larger crystal sizes tend to allow for larger spaces for intercrystalline diffusion pathways which one of ordinary skill in the art would expect to facilitate passage of larger aromatic compounds as set forth in Claim 1. However, the Applicants restricted the size of the crystals so that they are relatively small. Thus, contrary to what one of ordinary skill in the art would expect, the Applicants restricted the crystal size to one μm because they found that, if crystal size exceeds one μm , that smooth adsorption of the reaction substrates and smooth release of substrates will be difficult, thereby suppressing reaction activity. The crystal sizes are preferably 0.5 μm and, even more preferably, at most 0.1 μm .

In any event, the Applicants have demonstrated that one of ordinary skill in the art would tend to believe that three dimensional structures would be preferred, as would be larger crystal sizes. The Applicants did not do this. Instead, the Applicants utilize one dimensional pore structures and deliberately restrict the size of the crystals to be at most 1 μm . None of Davis, Zones and WO '486 provides any teachings or suggestions that contradict what those of ordinary skill in the art expect.

Moreover, all three references fail to teach or suggest modifications that would result in the claimed methodology. It must be remembered that an obviousness rejection must be based upon teachings or suggestions actually present in the references, coupled with a reasonable expectation of success. There are no teachings or suggestions in any of the three references to make the above-described modifications. Also, one of ordinary skill in the art would have a reasonable expectation of no success, based on what those of ordinary skill in the art would intuitively believe to be the result of restricting crystal sizes and restricting the pore structures to one dimensional structures, as recited in the solicited claims. None of the three references does anything to change that reasonable expectation of failure. The Applicants accordingly respectfully submit that none of the three

references can support the 35 U.S.C. §103 rejection. Withdrawal of the rejection is accordingly respectfully requested.

With respect to new Claim 13, the Applicants respectfully submit that these two points are not the only aspects of the invention that are not disclosed by any of Davis, Zones and WO '486.

In addition, the Applicants respectfully submit that Davis, Zones and WO '486 fail to disclose, teach or suggest the Applicants' claimed aspect wherein the minimum value of the pore aperture diameter of the major channels therein is larger than 0.65 nm and the maximum value thereof is between 0.70 and 0.9 nm. In fact, the Applicants respectfully submit that careful scrutiny of all three publications reveals that there is not one word about their relative pore aperture diameter. Thus, it could hardly be said to be obvious to make a modification to pore aperture diameter when such diameters are not mentioned at all.

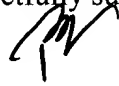
As a consequence, it would not only be necessary for one of ordinary skill in the art to modify the specifically claimed aromatic compounds and the specifically claimed crystal size, but would further be necessary to modify the pore aperture diameter of the major channels in a downward direction from that taught by Davis, as demonstrated by the Cal Tech website. This does not appear to make sense when attempting to isomerize larger compounds. Careful scrutiny of all three references reveals that there is no disclosure and there are no teachings or suggestions that would lead one of ordinary skill in the art to decrease the pore aperture diameter--which is what the Applicants did--when attempting to isomerize larger aromatic compounds. Thus, the Applicants respectfully submit that Claim 13 is patentable over all of Davis, Zones and WO '486 for this reason.

The Applicants respectfully submit that having to make three separate modifications to the prior art to reach the subject matter of Claim 13 simply cannot support an obviousness rejection under §103. The Applicants respectfully submit that it stretches §103 too far to take the position that it would be obvious to make three separate modifications to the cited references, without any teachings or suggestions to do so, in an attempt to support the obviousness rejection. All three of the references are silent with respect to reasons for attempting specific aromatic compounds. All three of the references do not even mention crystal sizes, much less suggest that such non-existent crystal sizes could or should be modified. Finally, there are no teachings or suggestions to modify the pore aperture diameter downwardly from the diameter of Davis, for example. In that regard, it must be remembered that the prior art must contain teachings or suggestions for one of ordinary skill in the art to make the modifications. Moreover, there must be a reasonable expectation of success that the modifications would or could bring about some benefit. All three references fail on both counts. There are no teachings or suggestions to make the modifications in maximum pore aperture diameter and there is nothing that would lead one of ordinary skill in the art to have a reasonable expectation that a benefit would or could result.

At best, the three references provide nothing more than an opportunity to “try” variations or modifications. “Obvious to try” has been forbidden for many years by the Federal Circuit as a test of obviousness. This is especially true when one of ordinary skill in the art would have to “try” three separate modifications to ultimately result in the claimed subject matter. The Applicants respectfully submit that Claim 13 is fully patentable over the Davis, Zones and WO ‘486 disclosures.

In light of the foregoing, Applicants respectfully submit that the entire Application is now
in condition for allowance, which is respectfully requested.

Respectfully submitted,



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